United States Department of Agriculture | Forest Service | Arizona Zone Entomology & Pathology | 2500 S. Pineknoll Dr. Flagstaff, AZ 86001

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Subject: Geometrid Defoliation on Mount Graham and Hawk Peaks

To: Paul J. Young, Ph.D.
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On April 23, Steve Dudley, Biological Technician, and Bobbe Fitzgibbon, Entomologist, from the Entomology and Pathology Group, Arizona Zone Office of Forestry and Forest Health, USDA Forest Service met at Mt. Graham with Elaine Lowery, Wildlife Biologist, University of Arizona. Dr. Paul Young, Director of the Mount Graham Red Squirrel Project, had requested a functional assistance due to heavy defoliation of both spruce and fir on Hawk and Mount Graham Peaks by an, at that time, unidentified geometrid. The squirrel project was established in 1987 to monitor the populations of these endangered squirrels and the annual conifer cone crop, a major source of food. A refugium has been set up as critical habitat for the squirrel on 1700 acres of the highest elevations (10,000 ft. and above) in the spruce-fir life zone of Mt. Graham. Since its establishment, parts of the refugium have experienced a bark beetle outbreak and a wildfire. Both events have impacted the forest. Concern that the defoliation would cause further tree mortality in this area prompted this investigation.

During the 1997 annual aerial detection survey for insect and plant disease activity on forested federal lands in Arizona, Steve Dudley had noted an area of approximately 500 acres of heavy defoliation on Hawk Peak and spotty defoliation over another 780 acres. Our ground check of Hawk and Graham Peaks confirmed and refined Steve's August 1997 observation on the area of heavy defoliation. The approximate acreage remained the same but the boundaries of the heavily defoliated areas have been adjusted based on the ground check of the area.

Geometrid larvae were present on the bark of the trees and on the snow under the trees. Several specimens were collected for rearing and observation. Elaine Lowery had already collected larvae in December and had reared several to adulthood in her laboratory. She had noted in her field notebook, that the caterpillars were active and feeding during the winter. During a squirrel survey in early May she noted a high level of larval mortality with the cadavers appearing shrunken and exhibiting a red coloration. At the time of the ground check little larval mortality was noted but we have since had considerable mortality among those collected for rearing and many cadavers have exhibited the red coloration and shrunken appearance. One cadaver seen in the field was hanging head down from the tree. The mortality may be an indication of the presence of a pathogen in the population. Two members of the genus Nepytia, the western false hemlock looper, N. freemani (Monroe), and the phantom hemlock

looper, N. phantasmaria, are known to be susceptable to neucleopolyhedroviruses. In addition to this mortality, many of the insect pupae were found to have been parasitized.

Defoliation on some trees was accompanied by needle mortality. Microscopic examination indicated that needle mortality was probably caused by caterpillar feeding damage. Much of the damaged foliage remained on the trees. However, some of the needles were clipped at the base and had fallen to the ground along with a considerable amount of fras from the caterpillars. Carrol et al (1967) noted this feeding pattern with hemlock looper, Lambdina fiscellaria. Defoliation was not consistent throughout the heavily defoliated area. Defoliation and leaf mortality of both spruce and fir ranged from 50% to 100% over the 500 acre area. Individual trees surrounded by completely defoliated trees, showed little defoliation.

Defoliated branches were checked for mortality, most were supple and green inside. Tree mortality due to the noted defoliation is difficult to predict. The insect causing the defoliation has just been identified as Nepytia janetae. It is unclear, at this time, if larval feeding will continue after the trees put out new needles this year. If feeding occurs only on the needles from the previous year, the impact on the trees would be much less than feeding on new foliage. The extent of the defoliation last year was not well documented. The high population levels and larval and pupal mortality could indicate that the population is ready to collapse. Other factors may come into play in the defoliated area, as well. Bark Beetle activity was noted in several locations. Bark Beetle infestations were limited to one to two trees per spot and were caused by both spruce beetle, Dendroctonus rufipennis, and Ips spp.. Continued stress due to defoliation or if a drought event would occur might make the trees more prone to bark beetle attack. Stressed trees are also more susceptible to plant pathogens.

Continued monitoring of the defoliated area by project biologists should consist of noting the occurrence of bud break on the trees, if insect feeding occurs on the new foliage, the range of dates where the caterpillars pupate and the occurrence and number of egg masses found. Ms. Lowery indicated that she was planning to put in impact plots within the defoliated area, if help is needed with this effort, please feel free to call on us for assistance. We will continue to do a literature search on Nepytia janetae to determine the biology and life cycle of the insect and to determine what, if anything, can be done to prevent further damage to the trees. We will also pay careful attention to the entire area when we do our annual insect and disease flight, scheduled for August.

Please keep us up to date on your progress so that we might work closely with you to resolve this situation. If you have any questions concerning this letter, please contact Steve Dudley (520-556-2071) or myself (520-556-2072).

Sincerely,

Bobbe Fitzgibbon,
Entomologist

CC: George Asmus, District Ranger, Safford Ranger District
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